

Experimental reports on using "Penzhangjing" for *Larix leptolepis*

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Abstract Experiments on spaying Penzhangjing on seedlings of *Larix leptolepis* was conducted for a year. The height growth and diameter at foot of experimental seedlings increased by 34.3% and 35.5%, respectively, compared with control seedlings. Variance analysis concludes that Penzhangjing have obvious effect on growth of height and diameter at foot of seedlings.

Key words: Penzhangjing, *Larix leptolepis*, Xylem, Seedlings

Introduction

The principal component part of "Penzhangjing" is BS (Brassinosteroide). BS, similar to Br (Brassinolide), is a new type of phytosterols growth regulator and has greatly biological activity. The International Plant Growth Material Meeting affirmed BS as a new type of plant hormone that is distinguishable from known plant hormone. Penzhangjing based on Bs is a compound of nutrient elements that many kinds of plants need, with function of sterilizing disease. In fourteen cities of Liaoning Province, Penzhangjing Spreading Problem Group is engaged in experimental demonstration of spreading Penzhangjing on seven kinds of crops and thirty eight breeds and achieved remarkable results in advancing growth, increasing production, preventing disease and the effect of improving product quality.

In the past forest nursery worked in traditional ways. Its primary exploration was on water, fertility, soil and strain and how to breed high quality and strong seedlings, increase economic benefit by raising the rate of seedling out of nursery. In 1996, Liaoning Academy of Forestry afforded Penzhangjing to make experiments on seedlings of *Larix leptolepis*. The experimental purpose was to observe the effects of Penz-

hangjing on promoting growth, preventing disease, resisting disease and promoting xylem, etc.

Experimental designs and methods

Niumaowu nursery is a big nursery in Kuandian Country. Seedlings were mainly composed of *Larix Leptolepis* and *Pinus koraiensis*. 0.13 hm² yearly transplant seedlings of *Larix Leptolepis* were sprayed with Penzhangjing and the control plot was 0.026 hm²

Spraying concentration was 25 g drug added 25 kg water. The first spraying time was on June 28, 1996, the second time on July 29, 1996, and the third time on August 31, 1996. Surveys on growth of seedlings, plant diseases and insect pests, and xylem degree were made on July 28, August 31 and September 29 in the same year.

Four repeats were done by 10 small plots for each repeat and every small plot was composed of one hundred seedlings of *Larix leptolepis*.

Result and analysis

Variance analysis results in height and diameter of seedlings at the third time were shown Table 1~7.

Table 1. The Increase Height and diameter at foot for the third survey¹⁾

Surveyed number		Height of seedling		Diameter at foot		Unit: cm
		Original data	Average	Original data	Average	
I	100	65, 70, 72, 69, 66, 68, 67,	68	0.89, 0.86, 0.89, 0.88, 0.85,	0.87	
CK	100	55, 62, 62, 54, 68, 59,	60	0.60, 0.65, 0.62, 0.61, 0.63,	0.63	
II	100	66, 68, 69, 66, 65, 69,	67.25	0.61, 0.62, 0.65, 0.59, 0.58,	0.608	
CK	100	55, 57, 60, 61, 60, 55,	58	0.55, 0.54, 0.59, 0.60, 0.61,	0.57	
III	100	65, 66, 64, 69, 69, 70,	67.5	0.88, 0.89, 0.86, 0.85, 0.88,	0.87	
CK	100	54, 58, 55, 55, 59, 57,	56.5	0.55, 0.56, 0.54, 0.57, 0.58,	0.57	
IV	100	70, 75, 71, 73, 69, 71,	71.75	0.81, 0.89, 0.87, 0.83, 0.82,	0.84	
CK	100	60, 63, 60, 64, 59, 58,	62.5	0.59, 0.63, 0.61, 0.58, 0.59,	0.60	

Table 2. Calculation and analysis of plant height

Unit: cm

	I	II	III	IV	$\sum_{j=1}^4 X_{ij}$	$\sum_{j=1}^4 X_i^2$	$(\sum_{j=1}^4 X_{ij})^2$	\bar{X}_i
Penzhangjing	68	67.25	67.5	71.75	273.5	18708.38	74802.25	68.38
CK	60	58	56.5	62.5	237	14062.5	56169	59.25
$\sum_{i=1}^2 X_{ij}$	128	125.25	124	134.25	510.5		130971.25	
$\sum_{i=1}^2 X_i^2$	8224	7886.56	7748.5	9054.31		32770.88		
$(\sum_{i=1}^2 X_{ij})^2$	16384	15687.56	15376	18023.06	65192.56			
\bar{X}_j	64	62.63	62	67.13				

Calculation of index of dispersion square sum:

$$L_B = 1/4 \times 65192.56 - 32576.28 = 20$$

$$\text{Adjusted value: } C = \frac{501.5^2}{2 \times 4} = 32576.28$$

$$L_e = L_{\text{total}} - L_A - L_B = 8.07$$

Freedom degree:

$$f_{\text{total}} = 2 \times 4 - 1 = 7, \quad f_A = 2 - 1 = 1, \quad f_B = 4 - 1 = 3$$

$$L_{\text{total}} = 32770.88 - 32576.28 = 194.6$$

$$f_e = f_{\text{total}} - f_A - f_B = 3$$

$$L_A = 1/4 \times 130971.25 - 32576.28 = 166.53$$

Table 3. Variance analysis for different comparison groups

source of variety	index of dispersion square sum	Freedom degree	Variance	F-value	F_a
A	166.53	1	166.53	$F_A = 612.5/1.5 = 61.91$	$F_{0.05}(1.3) = 10.1$
B	20	3	6.7	$F_B = 6.79/1.55 = 2.5$	$F_{0.01}(1.3) = 34.1$
Random error	8.07	3	2.67		
Sum	194.6	7			

Conclusions: $F_A > F_B$ means significant difference in comparison varieties and seedlings with spraying drug have good growth; $F_B < F_a$ means minimal

obvious difference in groups and zones and sprayed drug repeating had minimal difference.

Table 4. Calculation and analysis of plant diameter

Unit: cm

	I	II	III	IV	$\sum_{j=1}^4 X_{ij}$	$\sum_{j=1}^4 X_i^2$	$(\sum_{j=1}^4 X_{ij})^2$	\bar{X}_i
Penzhangjing	0.87	0.608	0.87	0.84	3.19		10.16	0.798
CK	0.63	0.57	0.60	0.60	2.37		5.62	0.59
$\sum_{i=1}^2 X_{ij}$	1.5	1.178	1.44	1.44	5.58		15.78	
$\sum_{i=1}^2 X_i^2$	1.15	0.69	1.08	1.07		3.99		
$(\sum_{i=1}^2 X_{ij})^2$	2.25	1.39	2.07	2.07	7.799			
\bar{X}_j	0.75	0.59	0.72	0.72				0.695

Calculating index of dispersion square sum:

$$L_A = 1/4 \times 15.78 - 3.89 = 0.055$$

$$\text{Adjusted value: } C = 1.954^2/8 = 3.89$$

$$L_B = 1/4 \times 7.799 - 3.89 = 0.0095$$

$$L_{\text{total}} = 3.99 - 3.89 = 0.1$$

$$L_e = L_{\text{total}} - L_A - L_B = 0.1 - 0.055 - 0.0095 = 0.0355$$

Freedom degree:

$$f_{\text{total}}=2 \times 4-1=7; f_A=2-1=1; f_B=4-1=3$$

$$f_e=f_{\text{total}}-f_A-f_B=3$$

Table 5. Variance analysis for different varieties

Survey of variety	Index of dispersion square sum	Freedom degree	Variance	F value	F_α
Variety A	0.55	1	0.55	$F_A=45.8$	$F_{0.05}(1,3)=10.1$
Variety B	0.0095	3	0.0032	$F_B=0.267$	$F_{0.01}(1,3)=34.1$
Random error	0.0355	3	0.012		
sum	0.1	7			

Conclusions: $F_A > F_B$ means significant difference in comparison varieties. Compared with sprayed seedlings and no sprayed seedling, sprayed seedling had

good growing.

$F_B > F_\alpha$ between zones and groups, and minimal obvious difference on sprayed drug seedlings.

Table 6. Survey table of growth quantity, diseases and pests, and xylem

Zones	Spraying times	Surveyed plant number	average growth	Height of plant		Diameter increase at foot %	Diseases and pests of little zones %	Plant number of xylem
				H /cm	D /cm			
Penzhangjing	3	1000	68.38	0.798	34.4	35.3	nothing	98
CK	3 times of spraying water	1000	59.25	0.59		17	88	

By the experiments on spraying Penzhangjing on yearly seedling of *Larix Leptolepis*, we can gain following conclusions:

The height and foot diameter of the seedlings with three times of spraying increased by 9.13 cm and 0.208 cm respectively. Seedling xylem increased by 10 percent.

For spraying Penzhangjing three times, the ratio of input and output is 1:102. Penzhangjing used in forest seedlings has a great prospect in spreading,

References

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